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Sun, for comparison with simultaneous records of terrestrial magnetism, before definite conclusions could be drawn.

If spots like those on the Sun are most numerous in the later stages of a star's development, it is conceivable that they may cover a large part of the disk of certain red stars. With sufficient dispersion it might therefore become possible to detect Zeeman doublets in the spectra of these objects. As a fixed spectrograph of great power is being provided for use with our 60-inch reflector, now nearing completion, I hope to make the necessary tests this autumn.

A more complete account of the sun-spot work, giving measures of the doublets and various other data, will soon be published in the *Astrophysical Journal*.

MT. WILSON SOLAR OBSERVATORY, July 3, 1908.

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## PLANETARY PHENOMENA FOR SEPTEMBER AND OCTOBER, 1908.

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BY MALCOLM McNEILL.

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### PHASES OF THE MOON, PACIFIC TIME.

First Quarter... Sept. 3, 12 <sup>h</sup> 51 <sup>m</sup> P.M.	First Quarter... Oct. 2, 10 <sup>h</sup> 14 <sup>m</sup> P.M.
Full Moon..... " 10, 4 23 A.M.	Full Moon..... " 9, 1 3 P.M.
Last Quarter... " 17, 2 33 A.M.	Last Quarter... " 16, 7 35 P.M.
New Moon.... " 25, 6 59 A.M.	New Moon.... " 24, 10 47 P.M.

The autumnal equinox, the time when the Sun crosses the equator from north to south, and autumn begins, comes on September 23d, at 3<sup>h</sup> A.M., Pacific time.

*Mercury* will not be in good position for observation during September and October. It passed superior conjunction on August 20th and became an evening star, but as its distance from the Sun increases its motion also carries it far to the south of the Sun, even more than is normal for eastern elongations in the autumn. It reaches greatest east elongation on October 4th. This distance, 25° 34', is considerably greater than the average greatest elongation, but the planet is at this time more than 11° south of the Sun. So the planet does not remain above the horizon as much as an hour after sunset,

and there is little chance for naked-eye visibility. Within a week after the time of greatest east elongation *Mercury*, as seen from the Sun, reaches its most southern point, and this fact, as stated before, has a considerable effect in shortening the interval between the setting of the Sun and of the planet. At the time of greatest elongation the interval is almost always more than an hour, but at this time it is only about fifty minutes. After the time of greatest elongation the planet moves toward inferior conjunction, reaching it and becoming a morning star on October 28th.

*Venus* is a morning star, reaching greatest west elongation on September 14th. On September 1st it rises a little more than three and a half hours before sunrise, or a little before 2<sup>h</sup> A.M. This interval increases about a quarter of an hour by the time of greatest elongation, and after that time it diminishes slowly, but up to October 31st is not less than three hours and one half. When *Venus* and *Mercury* reach their greatest west elongations in the autumn they are in favorable position for observation as morning stars, since they are then far to the north of the Sun and the interval between the rising of the Sun and of the planet is large. In like manner east elongations of these planets in the spring months give a good chance for observation as evening stars. *Venus* and *Jupiter* are in rather close conjunction on October 13th. The least distance between them is 36', and *Venus* is south of *Jupiter*. Both planets are below our horizon at the time of closest approach, but the distance will not be greatly increased by the time they come into view on the morning of October 14th.

*Mars* passed conjunction with the Sun on August 21st and became a morning star, but does not move far enough away from the Sun to become visible in the morning twilight until October. At the end of October it rises about two hours before sunrise, and it may be seen without much difficulty in the morning twilight. As it is now only about as bright as the pole star, it can not be seen as near the Sun as *Mercury* can. *Mars* reaches its aphelion on September 3d, a few days after the time of greatest distance from the earth, but the distance from us does not vary much until after October 1st. Until then it remains about 248,000,000 miles. During October it

lessens by about 6,000,000 miles,—not enough to cause much increase in the brightness. *Mars* excites general attention only when near opposition. These oppositions occur about once in a little more than two years. But during all times, except for a month or so near the time of conjunction, the planet is in plain view and can be easily seen by any one who looks for it in the right place.

*Jupiter* passed conjunction with the Sun on August 17th and became a morning star. By September 1st it rises about half an hour before sunrise,—too short an interval for easy visibility, even though it is one of the brightest planets. It soon, however, draws away from the Sun far enough to be readily seen, and by October 1st it rises about 3<sup>h</sup> A.M., and shortly after 1<sup>h</sup> 30<sup>m</sup> on October 31st. During the early days in September it is very close to the first-magnitude star *Regulus*, the brightest star in the constellation *Leo*. It is moving eastward and southward, covering about 12° during the two months' period.

*Saturn* comes to opposition with the Sun on September 29th, and is therefore above the horizon nearly the entire night throughout September and October, passing the meridian at about 2<sup>h</sup> A.M. on September 1st, at about midnight on October 1st, and before 10<sup>h</sup> P.M. on October 31st. It is moving westward in the constellation *Pisces*, about 4°, up to the end of October. The apparent breadth of the rings diminishes perceptibly the ratio of minor to major axis, changing from one eighth at the beginning of September to about one eleventh at the end of October. This diminution will soon cease, and the rings will broaden out again before the end of the year.

*Uranus* is in fair position for observation, passing the meridian at 8<sup>h</sup> 15<sup>m</sup> P.M. on September 1st, and at about 4<sup>h</sup> 15<sup>m</sup> P.M. on October 31st. It is nearly stationary in the constellation *Sagittarius*, a few degrees north of the easternmost star of the "milk-dipper" group. The nearest moderately bright star is  $\pi$  *Sagittarii* (a small fourth-magnitude), and the planet is about 1° west and 2° south of this star, in the direction of the bowl of the dipper.

*Neptune* rises shortly after 1<sup>h</sup> A.M. on September 1st, and at about 9<sup>h</sup> 15<sup>m</sup> P.M. on October 31st. It is in the constellation *Gemini*.